

Avista Utilities  
Cabinet Gorge Dam  
TDG Abatement

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Northwest Hydro Operators Forum  
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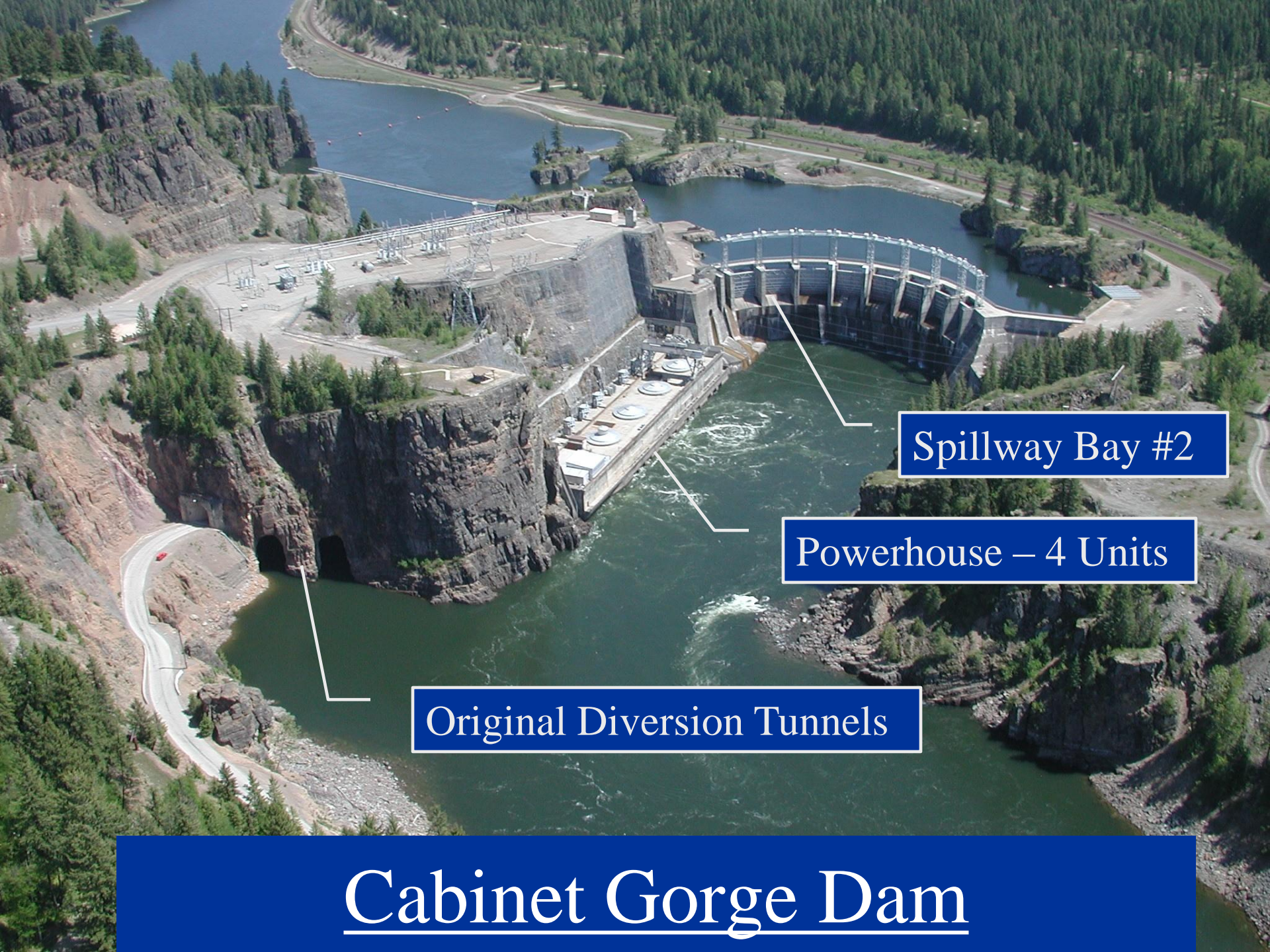
# What TDG?



# Concept Development

- Original idea: Re-open diversion tunnels to eliminate plunging spill
- Results of physical and numerical modeling were not satisfactory (high energy, turbulent flow)
- Back to the drawing board: 23 ideas identified
- cursory-level evaluation narrowed field to 5 concepts worthy of further investigation
- Final selection: Modify existing spillway crests





Spillway Bay #2

Powerhouse – 4 Units

Original Diversion Tunnels

Cabinet Gorge Dam



# Modifications Initial Construction 2012



# Spillway Crest Modifications Initial Results

## A Good News – Bad News Story

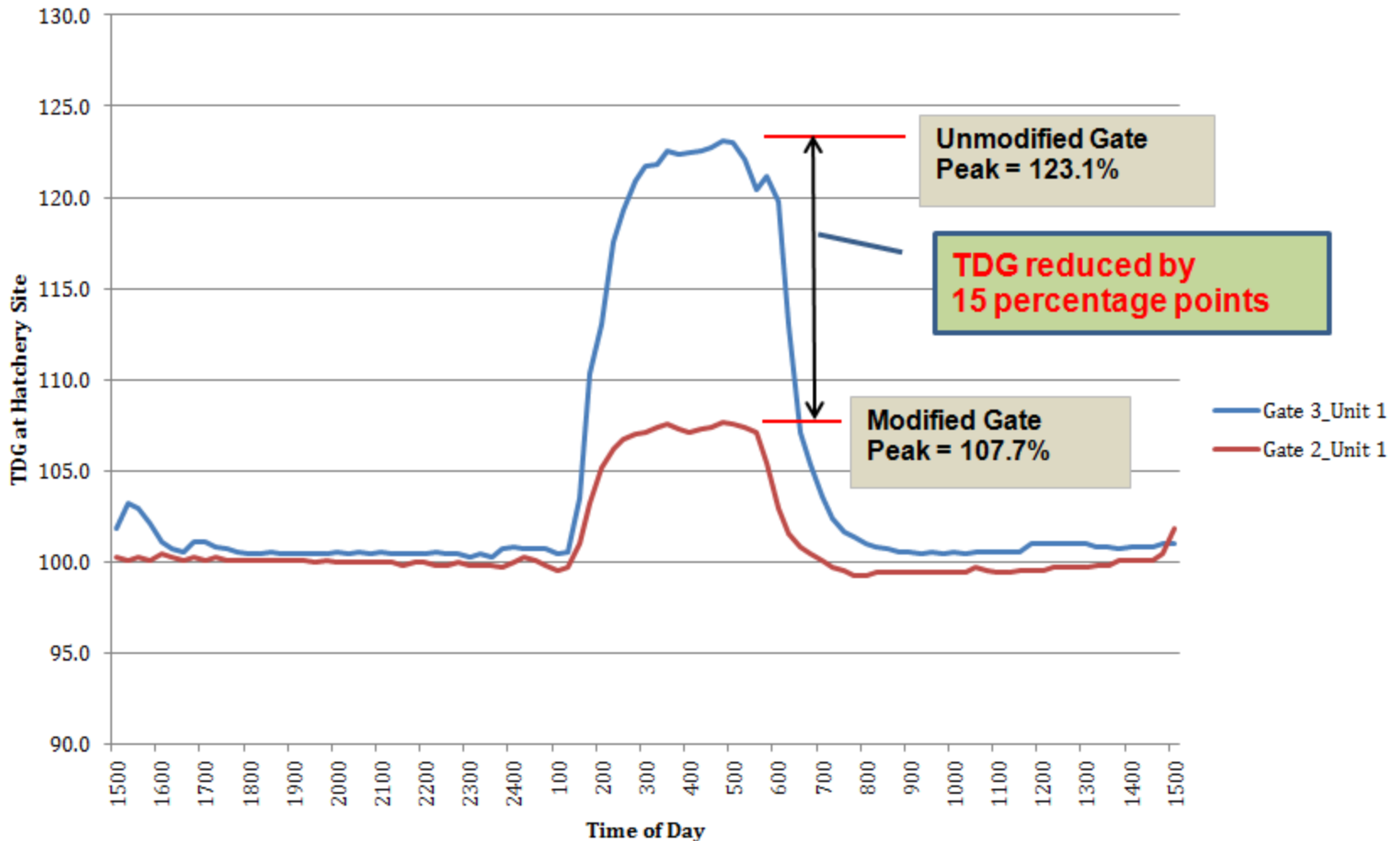
The Good News:  
TDG Performance Is Great!

# Modified and Unmodified Flow Comparison



# The Good News – IT WORKS!

**Comparison of Modified to Unmodified Gates**  
**PH Unit 1 = Spill = 7700 cfs each**





# The Bad News



Blocks Suffered Cavitation Damage That  
Is Not Acceptable

# Remedies For the Bad News

Remedial measures installed to reduce cavitation:

- Add ramp in front of first row of blocks
- Change geometry and materials of the blocks
- Add air venting to reduce negative pressures



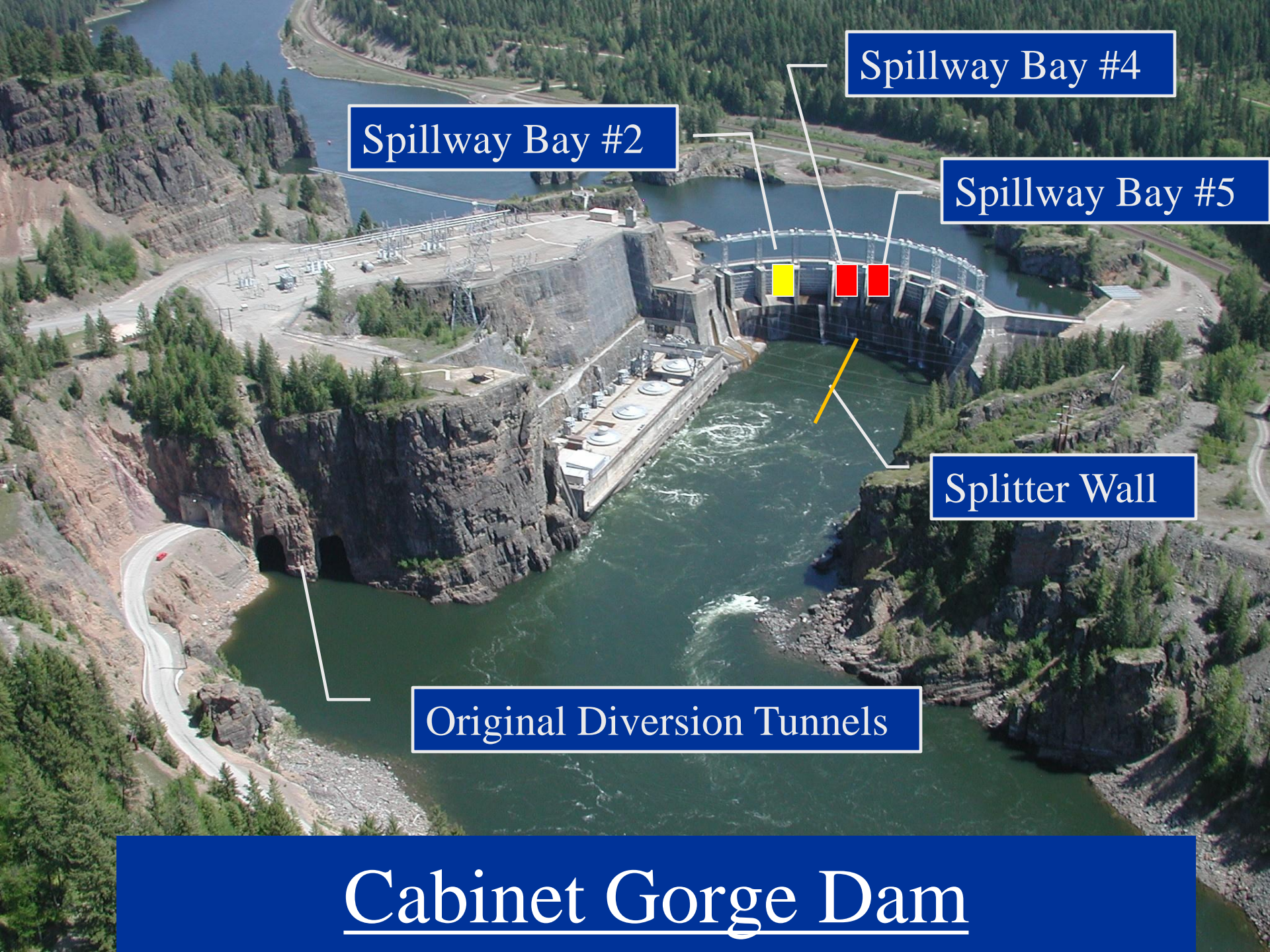


Bay #2 with Remedial Measures



# Results of Remedial Measures

- Operated for 26 days (same as in 2013)
- Hydraulic performance identical to original configuration
- No signs of cavitation
- No further work required on Bay #2



Spillway Bay #4

Spillway Bay #2

Spillway Bay #5

Splitter Wall

Original Diversion Tunnels

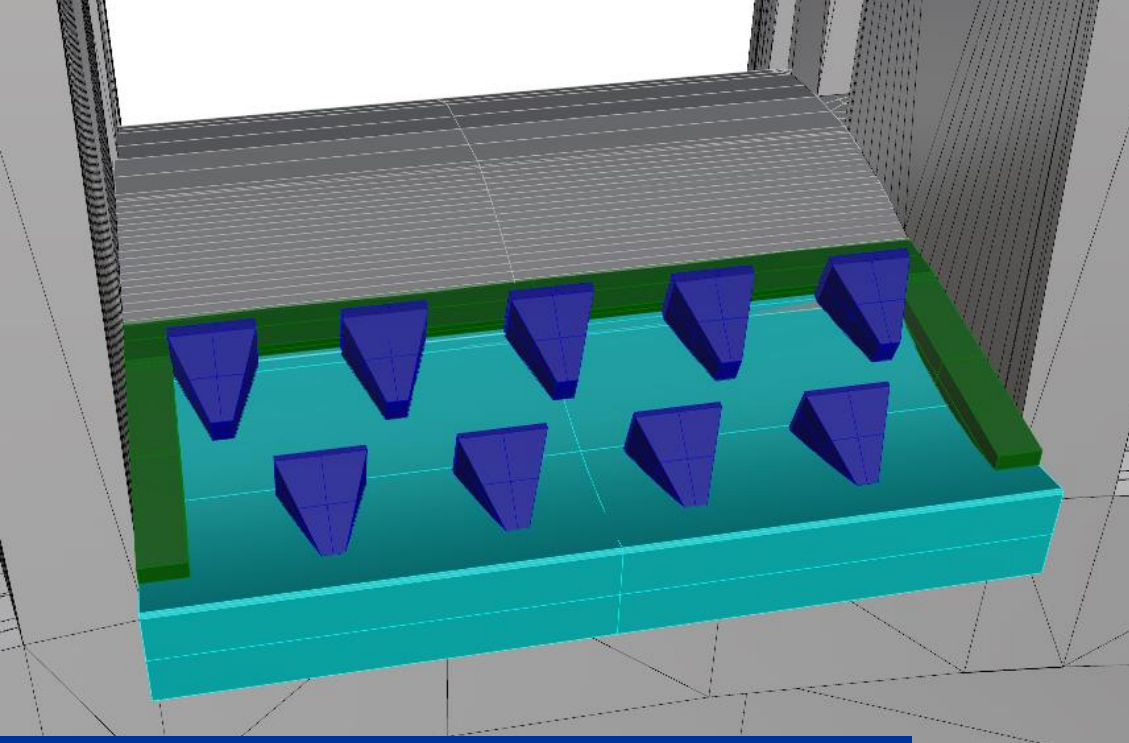
Cabinet Gorge Dam



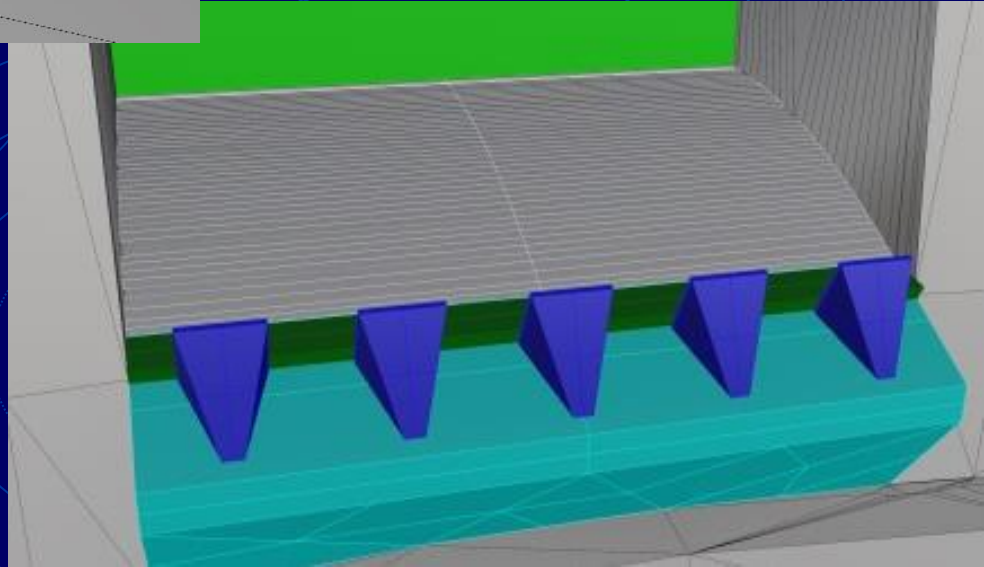
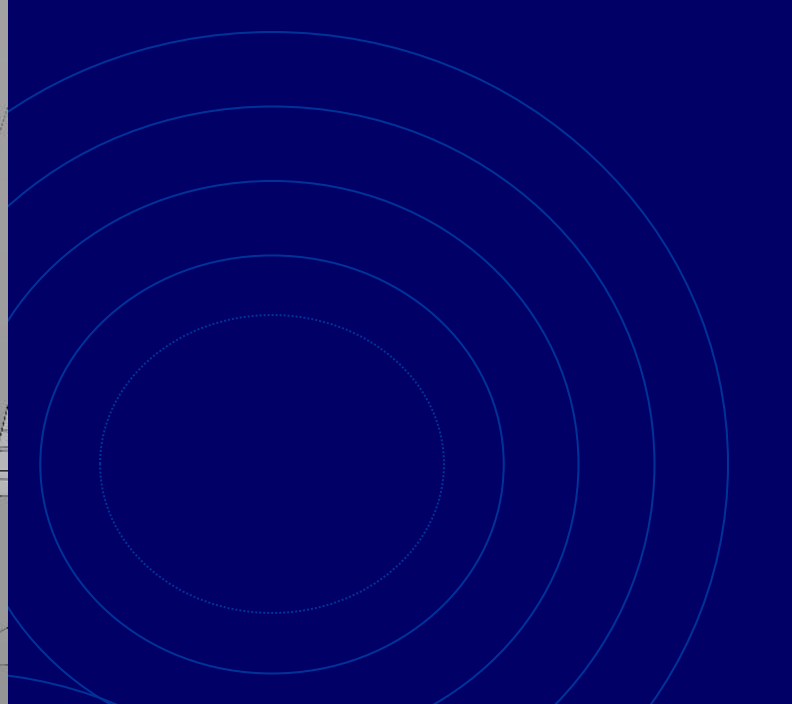
# Design Refinements For Bays 4 & 5

- Increase design flow from 6,000 to 7,200 cfs
- Increase height of blocks by 9 inches
- Install one row of blocks instead of two (reduces no. of blocks from 9 to 5)
- Move blocks downstream as far as possible
- Increase spillway extension from 5 to 6 ft
- No need for air venting





Bay #2

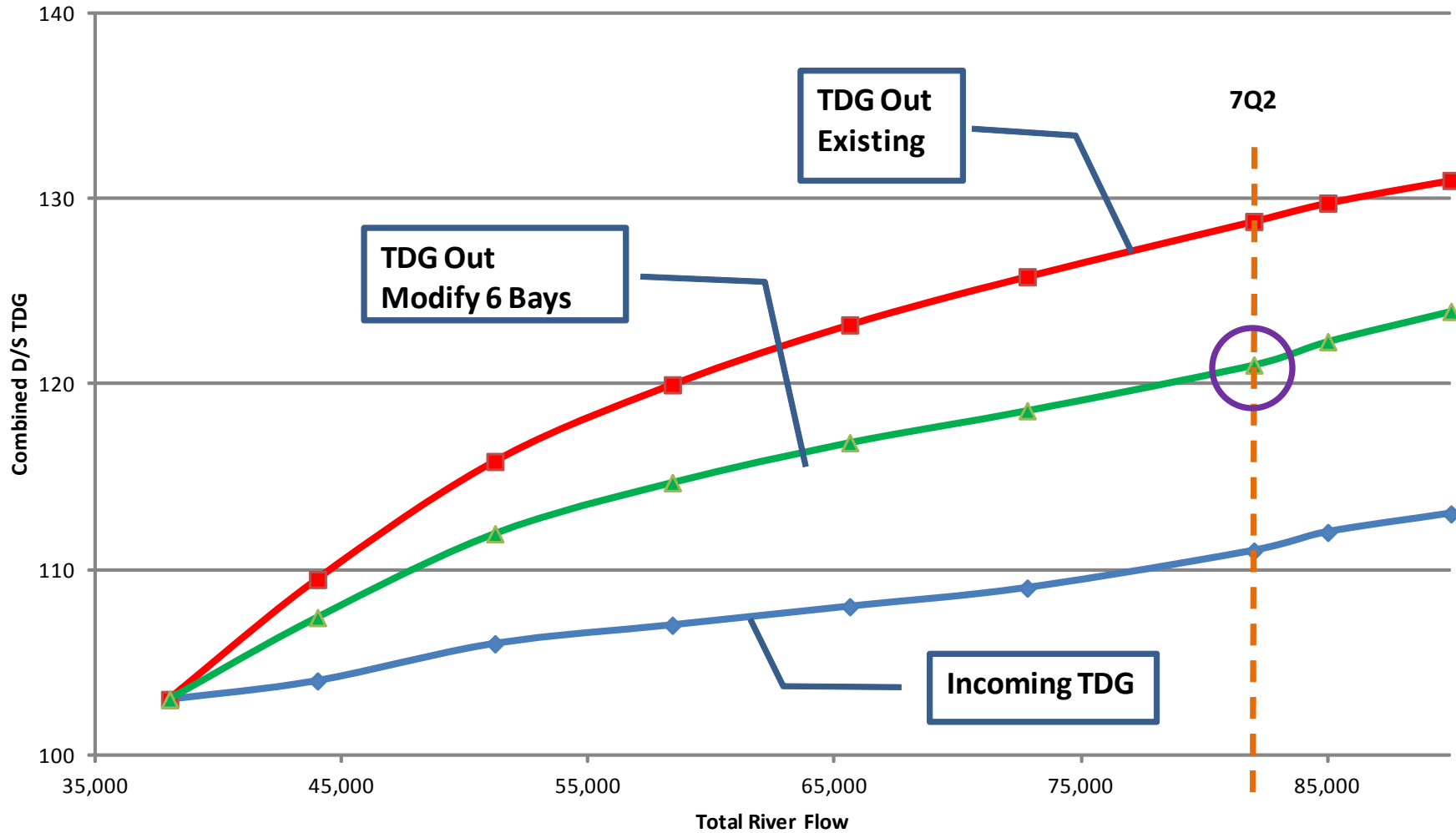


Concept For Bays #4 & #5

# Next Steps For Cabinet Gorge

- Construct modifications on Bays 4 & 5 in 2015
- Test, Operate, and Evaluate in 2015
- Results of TDG performance testing between bays on the shallow and deep sides of the tailrace will ultimately dictate how many bays are modified.
  - Minimum of 4 bays (#2-#5)
  - Maximum of 6 bays (#2-#7)

## TDG Forecast - Modify 6 Spillway Bays





# Cabinet Gorge TDG Abatement



Questions?